Reformulation of Gasoline: Liquid-Liquid Phase Equilibria and Solubilization Phenomena

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With a view to define the concentration of methanol that can be added to a blend of hydrocarbons without producing liquid-liquid partial miscibility, we have determined experimentally the liquid-liquid phase diagram for the system isooctane + benzene + methanol at 298.15 K. The water presence in different concentrations modifies the liquid-liquid phase behavior; hence, we have studied the pseudoternary system: isooctane + benzene + (methanol 80 mass % + water 20 mass %) and isooctane + benzene (methanol 90 mass % + water 10 mass %) at 298.15 K. The temperature is a factor that does not have great influence on the phase behavior of the studied system as shown by the results for isooctane + benzene (methanol 80 mass % + water 20 mass %) at 308.15 K. The studied systems present a type II liquid-liquid phase diagrams. We have also studied the solubilization behavior of the pseudoternary system by adding 5 mass % at 298.15 K, and 15 mass % of the surfactant sodium bis(2-ethylhexyl)sulfosuccinate (Aerosol-OT, AOT) at 298.15 and 308.15 K. The results show that the liquid-liquid miscibility of the pseudoternary system increases as the concentration of AOT increases due to the formation of inverse micelles. These results are relevant for the formulation of gasolines having methanol as an oxygenate.